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Experiment to evaluate feasibility of utilizing SKYLAB-EREP remote sensing data for tectonic analysis of the Bighorn Mountains region, Wyoming-Montana

Quarterly Progress Report, October 1 - December 31, 1973

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E74-10273) EXPERIMENT TO EVALUATE  
FEASIBILITY OF UTILIZING SKYLAB-EREP  
REMOTE SENSING DATA FOR TECTONIC ANALYSIS  
OF THE BIGHORN MOUNTAINS REGION, (Iowa  
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## STATUS SUMMARY

### Additional imagery received from SL-2, June, 1973

1. Track 5 - Three Forks, Montana to Crawford, Nebraska
  - a. A-190A - 9X9 transparencies
    - 1) Color IR (EK 2443) 0.5-0.88  $\mu\text{m}$
    - 2) Color (SO-356) 0.4-0.7  $\mu\text{m}$
  - b. S-190B - 9X9 transparencies, B&W, positives and negatives
2. Track 19 - Billings, Montana to northwestern Nebraska
  - a. S-190A 9X9 transparencies
    - 1) Color IR
    - 2) Color
    - 3) B&W (positives and negatives)
  - b. S-190B - 9X9 color transparencies

### Imagery received from SL-3

- a. S-192 - Channels 2, 7, 11 Track 59 (displaced eastwards)
- b. S-190B - A color print (S-73-35081) as a part of an SL-3 publicity package  
[Important note - This photo gives superb coverage of the Pryor - Bighorn Mts. area, all included in this project. However, we have received no data booklets for this track (45) as we have for track 59. It would be appreciated if we could get this track 45 because, as a result of the eastward drift, this track passed over the project area].

### RB-57 imagery

Color IR along track 59 (Wind River Mtns. to northwestern Black Hills) and track 5 (Beartooth Mtns. to northwestern Nebraska)

#### Coverage conditions:

Track 59 (Sept. 18, 1973) - Broken cumulus at SW end becoming clear over Wind Rivers except for cloud patch over northeast flank. Thin clouds and haze from Ocean Lake across Boysen reservoir and Owl Creek Mtns. Clear across southern Bighorns. Two small areas of thin haze and clouds over Powder River basin (Powder River, Gillette). Becomes overcast at northeast end.

Track 5 (Sept. 17, 1973) - Clear along entire track

## EVALUATION OF IMAGERY RECEIVED DURING REPORT PERIOD

### S-190A (SL-2)

1. Color IR
  - a. Track 5 - Conifer forests quite dark. Red tones appear to be mainly areas of cultivation and grass cover. Colors in Big Horn basin mostly different shades of blue or bluish gray. Little or no expression of red beds in yellow hues even around the Sheep Mountain anticline or in the southeast part of the basin and southern Bighorns where these rocks are well exposed.

- b. Track 19 - Forest very dark. Only cultivated areas are red; grasslands green. Only slight yellowish hue where red beds exposed. Light colored lithologies show up well.

## 2. Color.

- a. Track 5 - Better resolution than color IR. Red beds are more mappable in most places, but heavy green grass cover at this time of year (June) tends to mask lithologies. Topography, drainage quite good. More detail in center of Big Horn basin (both color tone contrast and drainage) than in any other orbital imagery to date.
- b. Track 19 - Very green. Better definition of red beds than color IR but still much masked by grass cover.

### S-192 (SL-3)

This imagery is in a larger scale format than that of SL-2 and is of much better quality. Channels 2 and 11 give the best contrasts and complement each other. Though this imagery naturally does not provide the detail of the camera systems, nevertheless the larger scale structures are visible and one can easily view the whole track at once.

### S-190B (SL-3) Photo S-73-35081

This color print was studied in some detail for any indications of an eastward continuation of the Nye-Bowler lineament (Sage Creek fault) beyond the Pryor Mountains. No such extension is apparent across the north end of the Bighorns. Two possibilities should be investigated: the nature of the termination of the Bighorn uplift at the Big Horn river and a small deflection of the Big Bull Elk Monocline. Unfortunately this area is a part of the Crow Indian reservation and is not open to geologists.

### An additional comment:

It is interesting to note that our qualitative relative ranking of film resolutions of S-190A, SL-2, Track 19, Black Hills area agrees with that figured in the Sensor Performance Report, Volume 1, MSC-05528, figure 6.2-1.

### RB-57, Color IR

Track 59 - No apparent mappable units or structure over most of Powder River basin. Drainage is beautifully developed; detailed plotting and analysis of drainage patterns might yield structural clues. Yellow coloration of red beds weak. Impressive detail (fractures, faults) in Precambrian northeast of Boysen reservoir (in spite of haze). Excellent delineation of structure in southeast Big Horn basin and southern Bighorns.

Track 5 - Superb imagery of Beartooth range. Excellent structural detail east of Big Horn river. Yellow of red beds a bit stronger than on track 59. Scattered pale yellow areas in southern Powder River basin are probably exposures of red clinker beds in the Wasatch (Eocene) formation.

## SUMMARY OF SIGNIFICANT RESULTS

S-190A color transparencies from SL-2 of the Big Horn basin region provide the best format to date for geologic study of that region; red beds are quite mappable and resistant key beds sharply outlined. An S-190B color frame from SL-3 of the Pryor-Bighorn mountains provides no indication that the Nye-Bowler lineament extends east of East Pryor Mountain. This has important implications regarding the role of this and other lineaments (which also appear to be of restricted length) in the tectonics of the region. Extensions of these lineaments for great distances does not seem warranted on the basis of surface evidence.